Ms. Padilla’s 3rd Grade Science Lesson Plan

**Essential Questions:**

* + What is heat energy?
  + What is thermal energy?
  + What happens to water molecules in hot and cold temperatures/substances?

**Big Idea:**

During this hands-on lesson students will learn about energy, heat, and temperature by experimenting with a glow stick. The students will also become familiar with using and recording information taken with a thermometer. Molecules with a lot of energy move faster than molecules with a smaller amount of energy. When a glowstick is placed inside hot water, the molecules inside it move faster, causing it to shine brightly. However, when a glowstick is placed inside ice water the molecules from the glowstick move slower, causing it to be less illuminated. This activity will allow students to visually see and understand the relationship between temperature and energy.

**Objectives:**

* + Students will understand the relationship between heat and temperature.
  + Students will be able to name types of energy sources around them daily.
  + Students will be able to identify how heat can be measured and become familiar with using a thermometer.
  + Students will understand heat energy and thermal energy.

**Assessment(s):**

The worksheet that each student completes when recording their hypothesis, observations, and make their conclusions also has a few comprehension questions on it to informally assess student understanding.

Teaching

**Materials:**

2 cups (per group of students), 2 glowsticks (per group of students), hot water, ice water, and thermometers

**Introduction:**

To introduce the lesson allow the students to physically role play. Have them all stand up next to their desks. Explain to them that when something gets really hot the molecules inside of it move really fast and expand. Then allow the children to move **all around** the room really **quickly**. Next, explain to the children that when something gets really cold the molecules inside of it move really slowly and contract. Then allow the children to **slowly** move back to their seats and come back together. That will help the children visually picture the temperature differences as you prepare to teach them about energy, heat, and temperature.

**Instruction:**

* Pass out a procedural worksheet that contains directions for the experiment along with places for students to follow the scientific method by recording their hypothesis, observations, and conclusions.

1. Remove two glowsticks from their wrappers. Bend the glowstick until you hear a snap. This activates the glowstick by breaking the seal and allowing two solutions to interact, producing light.
2. Fill up two clear plastic cups, one cup should have hot water in it and the other should contain ice water.
3. Test the temperature of the water by placing a thermometer in the water and record the temperature.
4. Place the one glowstick in each cup and record the observations.
5. Have students calculate the difference between the temperature of the hot water and the ice water to help them make further connections between heat and molecular movement.

**Wrap-Up:**

At the conclusion of the lesson briefly discuss the student’s understanding of how heat affects molecules. The glow stick in the hot water is getting warmed up so the particles are moving at a faster rate, causing it to glow brighter. The glow stick in the cold water is getting colder so the particles are moving at a slower rate, causing it to glow less. Explain to students that the heat energy from the different temperature cups transferred to the glowsticks, and have students try to identify the thermal energy that took place during the experiment (heat from the hot water transferred to glowstick & heat from room temperature glow stick transferred to cold water). Discuss which types of energy transfer took place (convection). Also encourage students to think critically about how heat is used and can be used in society.

Sample questions to discuss:

* + - What is heat used for in your home or at school?
    - What types of energy sources are around us?
    - What is the relationship between heat and molecular movement?
    - How can heat be measured?

**Glow Stick Experiment**

Hypothesis: What do you think will happen to the glow stick placed in **cold** water? Why? What do you think will happen to the glow stick placed in **hot** water? Why?

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Observations/Data: Describe the glow sticks’ appearance at each stage in the experiment.

|  |  |
| --- | --- |
| Glow Sticks – BEFORE the experiment |  |
| Glow Sticks- AFTER 2 minutes in hot and cold water |  |
| Glow Stick-removed from cold water |  |
| Glow Stick- removed from hot water |  |

Conclusion: Explain why your hypothesis was correct or incorrect from your observations and recorded data.

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Scientific Thinking Rubric

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| --- | --- | --- | --- | --- | --- |
|  | **1** | **2** | **3** | **4** | **5** |
| **Critical Thinking** | * Often requires help in order to critically examine information * Support, if provided, is irrelevant or based on personal opinion, disregarding scientific principles and knowledge | * Requires teacher prompting to examine information using scientific principles * Generalized supporting example is somewhat relevant * May use some scientific knowledge | * Mostly works independently to examine information using scientific principles and knowledge * 1 or 2 somewhat generalized but relevant examples provided to support or refute ideas | * Independently examines information using scientific principles and knowledge * Provides 2 or 3 relevant examples to support or refute ideas | * Independently examines information using scientific principles and knowledge * Will provide 3 or 4 specific and relevant examples to support or refute ideas |
| **Problem Solving** | * Is not able to recognize or understand problem without teacher instruction * Is not able to use scientific process without teacher help | * Often requires teacher prompts to recognize and understand problem * Often requires teacher help to begin using scientific process | * Generally able to recognize and understand problem * Able to use scientific process to attack problem * Will on occasion get help from peers to use scientific process to seek solutions | * Independently recognizes and understands problems * Uses scientific process to seek solutions * Will sometimes develop new questions | * Independently recognizes and understands problems * Readily uses scientific process to seek solutions * Will often develop new, original questions |
| **Reflection upon Scientific Ideas and Principles** | * Requires teacher help to examine ideas * Disregards the ideas of others | * Requires teacher prompts to examine ideas * Has difficulty accepting the ideas of others | * Will generally reflect on ideas * There may be some gaps in logic * Will accept other ideas | * Will, on most occasions, reflect on ideas * Logic is generally sound * Recognizes value of other ideas | * Will consistently reflect on ideas * Logic is sound and provided with sufficient detail * Recognizes value of other ideas * Will often help others to evaluate ideas |
| **Creative Thinking** | * Has difficulty seeing paths to possible solutions * Often requires teacher significant help to recognize connections in ideas | * Generally will follow established path to possible solutions * On occasion becomes sidetracked, losing path * Requires teacher prompts to recognize connections among ideas | * Will generally generate a logical path to a possible solution * May require some help to recognize connections between own ideas and those of others | * Generally recognizes 1 or 2 paths for possible solutions * Is capable of connecting own ideas with those of others to find solutions to problems | * Consistently sees several paths for possible solutions * Adapts and connects own ideas and those of others to develop unique questions and solutions to problems |

Grade Total\_\_\_\_